SPECIAL SPECIFICATION

13037S

CLEANROOM ACCESS FLOORING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section specifies the requirements necessary to furnish and install the cleanroom access flooring system. Work shall include the following:

1. Aluminum Access Flooring Panels

2. Aluminum Access Flooring Understructure/Support Assembly

3. Aluminum Access Flooring Accessories

1.02 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Requirements of the following Project Specification Sections apply to this section:

1. Section 01112S – CLEANROOM CERTIFICATION AND ACCEPTANCE

2. Section 01110S – CLEANROOM CONSTRUCTION PROTOCOL

3. Section 01111S – CLEANROOM CONSTRUCTION AND CLEANING PROCEDURE

4. Section 13036S – CLEANROOM WALL SYSTEM

5. Section 13063S – CLEANROOM CEILING GRID SYSTEM (GASKETED).

6. Section 09670S – FLUID-APPLIED FLOORING

C. CAUTION: Use of this Section without including all of the above-listed items will result in Omission of basic requirements.

D. In the event of conflict regarding cleanroom access flooring requirements between this section and any other section, the provisions of this Section shall govern.

1.03 DEFINITIONS/DESIGN CRITERIA

A. Access flooring is a complete portable assembly of modular floor panels on an elevated understructure support system. This support system forms an underfloor cavity that accommodates electrical, mechanical, and piping services.

B. Structural Performance

Access floor system and bracing designs shall be in conformance with the following:

1. International Congress of Building Officials (ICBO)

2. International Building Code (IBC 2000)

3. Ceiling and Interior System Construction Association (CISCA) "Recommended Test Procedure for Access Floors"

4. American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-formed Steel"

5. American Construction Industry (ACI) construction tolerances and deflection of building structural members.

6. American with Disabilities Act (ADA) of 1990 (42 U.S.C. Section 12181).

7. ASTM Special Publication No. 91-A

8. National Fire Protection Association (NFPA) 75

C. System's Requirements

Provide manufacturer's access flooring system which, when installed, complies with the following minimum requirements for structural performance:

1. Access Floor Panel

Units, including those with cutouts, capable of supporting design loads of type and magnitude indicated below:

a. Uniform Live Load: 750 pounds per square foot (psf)

b. Concentrated Load: 3,000 pounds per square foot (psf) concentrated load applied to one square inch located anywhere on the panel, with a maximum top surface deflection not to exceed 0.100 inches (2.54 mm) and a permanent set not to exceed 0.100 inches (2.54mm) over a 24 inch span after the load is removed.

c. Rolling loads of the following magnitude applied to panels through a wheel or caster of material and size described below; with a combination of local and overall deformation not to exceed 0.04 inch measured across panel's 24-inch span after exposure to rolling load for indicated number of passes of the same path:

(1) Rolling load of 2,000 pounds (907 Kg) applied through a 6-inch(15cm) diameter wheel with a hard-rubber tread surface of 1-1/2(3CM) inch width for 10,000 passes.

(2) Manufacturer shall provide engineering data related to the endurance strength of the material in use. The manufacturer should reference manufacturer's endurance data to industry standards issued by ASTM, ASME, or SAE. ASTM Special Publication No. 91-A, Guide for Fatigue Testing and the Statistical Analysis of Fatigue Data, is a source of reference.

d. Impact Loads: Capable of withstanding the 200 lbs. impact load (for solid panel and 100 lbs. for perforated panels) when dropped from 12 inches onto a 1-square-inch area located anywhere on the panel with an indentation not to exceed 0.06 inch.

2. Access Floor Pedestal (Heavy Duty)

a. Pedestal assemblies shall be secured to the concrete with adhesive, capable of withstanding the following types of loads per pedestal, without panels or other supports in place:

b. Bending moment of 1,000 inch-pounds for 2-foot-high raised floor when adhesively bonded to the floor system.

c. Axial load of 10,000 pounds without permanent deformation.

d. The dynamics of moving equipment must not overstress the axial or bending load; i.e., if the values for the loads listed for temporary equipment moving panels will surpass, provide pedestals with greater bending moment and axial load capability (see paragraph 1.3.C.2.d.).

e. Heavy-duty pedestals shall meet the requirements of the IBC, latest edition adopted, or local governing codes for the applicable seismic zone of the project site. The formula for seismic calculation shall be altered only by a change of the seismic zone coefficient "Z " in the formula:
Fp = ZIpCpWp

(1) Fp: Working load seismic force

(2) Z: Seismic Zone Factor

(3) Ip: Importance Factor

(4) Cp: Numerical Coefficient

(5) Wp: Weight of components

f. Wp shall be derived from 25 percent of a 250-psf live load, 10-psf partition load, and 10-psf dead load (which equals a unit load when combined); a 62.5-psf live load and 20-psf dead load. The total load to be used for Wp shall be this unit load multiplied by the tributary area of each heavy-duty pedestal:

total Wp = (20+62.5) X tributary.

g. Each heavy-duty pedestal shall sustain a minimum safety factor of 2.5 times the Wp before ultimate failure. The lateral deflection of the top of each heavy-duty pedestal shall not exceed 0.005h when subjected to the working load Wp where H equals the height of the pedestal.

3. Pedestal Adhesive

a. For the pedestal base area, the adhesive shall be capable as installed to resist a 1,000 inch-pounds overturning moment and 500 lbs. shear applied to base parallel to floor. It is the Contractor's responsibility to ensure that these stated bending moment and shear performance criteria is met as installed, regardless of the presence of a special coating on the floor surface.

4. Pedestal Support Assembly

a. Provide structural pedestal support assembly where required to provide support for pedestals over the floor opening where they are split by plenum dividers and cannot bear directly on the concrete septum. Design pedestal support assembly to withstand the eccentric loads to which the support will be subjected based upon the specified structural performance of the pedestals.

5. Lateral Stability of System

   a. System shall not rely on panels for stability.

   b. Proposed diagonal bracing for lateral stability shall be reviewed by the architect/owner before proceeding with design. Lateral stability requirements shall be met whenever possible without the use of diagonal bracing.

6. Seismic Design Criteria:

   a. Seismic loads in accordance with International Building Code 2000. Site Class D, Stiff soil. Importance Factors I=1.5. Ip=1.5 for Seismic Use Group III (three). Site specific parameters:

      Sms = 0.795, Sds = 0.53.
      Sml = 0.374, Sdl = 0.25
      Seismic Design Category D.

1.04 SYSTEM DESCRIPTION

A. Access Flooring System

The access flooring system is a modular system of lift out aluminum floor panels and support pedestal with under structure of bolted stringers at a raised floor height of 2'-0" high raised floor.

1. Solid aluminum floor panels with nickel chrome factory finish, with edge trim. (at non-wet areas)

2. Solid aluminum floor panels with powder coated epoxy finish, with edge trim. (at wet- areas)

3. Perforated aluminum floor panels with nickel chrome factory finish, with edge trim. (at non-wet areas)

4. Perforated aluminum floor panels with powder coated epoxy finish, with edge trim. (at wet-areas).

5. Aluminum grate floor panels with nickel chrome finish. (at non-wet areas)

6. Aluminum grate floor panels with powder coated epoxy finish. (at wet areas)

7. Heavy duty aluminum pedestal assembly (at non-wet areas)

8. Heavy duty aluminum pedestal assembly with powder coated epoxy finish (at wet areas).

B. System Components:

1. Removable access floor panels

2. Pedestals and fastening system (including bolted stringers)

3. Systems bracing (seismic and ledger angles)

4. Systems electrical and electrostatic grounding

1.05 SUBMITTALS

A. General

The following shall be submitted in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Submit manufacturer's technical data and installation procedures for each types of access flooring used. The submittal shall also include manufacturer's maintenance instructions and spare parts list.

C. Shop Drawings

Submit shop drawings indicating complete layout of access flooring based on field verified dimensions. The shop drawings shall be prepared by the access floor system manufacturer. Show details of all finish work required to do a complete installation including the following: attachments, anchorages, reinforcements, bracing details, assemblies, and closing connections between members and with adjacent construction; locations of all joints, joinery techniques, and materials, fastening, and sealing methods; and sealant materials and sealant system as well as vibration isolation details, threshold details, and field cut-out details. Identify all materials, including metal alloys, fasteners, and all shop and field sealants by product name and locate on shop drawings. Provide isometric or other drawings which explain or define certain interconnections.

D. Provide Qualification data for companies and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners.

E. Product test reports shall be from qualified independent testing laboratories demonstrating compliance of access flooring with performance requirements, based on comprehensive testing performed by a qualified independent testing laboratory or by access flooring manufacturer and witnessed by qualified independent testing laboratory.

F. Structural computation data for earthquake load resistance shall be signed and sealed by a qualified, registered professional engineer responsible for their preparation. Include structural calculations, materials properties, and other information required for structural analysis and verification that the system will withstand earthquake loads indicated.

G. Submit a quantity list of all access floor system components and accessories.

1.06 QUALITY ASSURANCE

A. Refer to Section 01110S – CLEAN CONSTRUCTION PROTOCOL

B. NFPA Standard: Provide access flooring complying with NFPA 75 requirements for raised flooring.

C. Installer Qualifications

Installers shall be those who have been approved by the access flooring manufacturer for installation of the types of access flooring required for this project. Installer is to have at least 5 years experience successfully installing access flooring systems of a scope similar to this project.

D. Engineer Qualifications

The professional engineer shall be licensed to practice in the jurisdiction where project is located and shall be experienced in providing engineering services of the kind indicated which has resulted in the successful installation of systems similar in material, design, and extent as shown on drawings and specifications.

E. Single Source Responsibility

Access flooring shall be provided by a single manufacturer.

F. Random Performance Testing

1. Acceptance Criteria:

a. Each panel tested shall comply with the structural performance requirements stated above. Any panel that fails its performance test shall be rejected and

additional panels will be randomly selected and also performance tested at no additional cost. Additional panels will be tested until the Owner achieves a level of confidence in the manufacturer to supply a quality product. If more than 10 percent of the samples tested fail the performance requirement, the Owner will reserve the right to renegotiate and/or cancel the terms of the Contract.

2. The floor system shall be designed and bear the stamp of a registered professional

3. engineer where the project is located.

G. The manufacturer's service representative shall inspect the final installed product and issue a letter certifying that the installation was performed in a manner that will enforce all of the warranty requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery

Deliver access flooring components in original, unopened packages, clearly labeled with manufacturer' name and item description. Material shall be shipped in a condition that will protect it from mechanical and moisture damage.

B. Storage & Handling

Handle and store packages containing access flooring in a manner, which avoids overloading building structure. The locations for storage will be coordinated and approved by the Owner.

C. Inspection

Immediately upon receipt, each carton shall be visually inspected for shipping damage, such as crushed corners or sides, or loose panels that have come free. Suspect items shall be further inspected and the extent of damage shall be accessed.

D. Damaged materials shall be separated from undamaged carton conspicuously marked "rejected", returned to the factory and replaced at the manufacturer's cost. Materials shall be removed from the job site by contractor within five (5) days of their receipt or they will be removed from the job site by the Construction Manager or Owner, and the costs for removal back charged to the Contractor.

E. Special clean wipe down and packaging is required of all modules in accordance with Section 01111S – Cleanroom Construction and Cleaning Procedure.

F. Deliver extra materials to the Construction Manager. Furnish extra materials described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Standard Field Panels and Understructure:

Furnish quantity of standard field panels and understructure components to support them equal to 3 percent of the amount installed and 5 percent of floor accessories installed.

1.08 PROJECT/SITE CONDITIONS OR SPECIAL CONDITION

A. Environmental Conditions

Do not proceed with installation of access flooring until installation area is enclosed and has an ambient temperature of between 40 degrees F dry bulb (4.4 degrees C) and 90 degrees F dry bulb (32.2 degrees C), and a wet bulb of not more than 70 degrees F.

B. Field Measurements

Take field measurements before fabrication; show recorded measurements on final shop drawings. Notify Owner's representative in writing, of dimensions found to be different than shown, including specified tolerances. Use established benchmarks as basis of measurements.

1.09 WARRANTY

A. The manufacturer and Contractor shall provide in writing a warranty for a minimum of 5 years from date of Owner acceptance that the access flooring and accessories will be free from defects in material, factory workmanship, and installation (including any defect that results in the floor becoming un-level). The warranty shall include the cost for removing and replacing defective components. Owner acceptance shall be a letter from the Owner stating his acceptance of the final installation; this will begin the warranty period.

1.10 MAINTENANCE

A. Maintenance Manuals

Furnish Complete manuals describing the materials, devices, and procedures to be followed in cleaning and maintaining the work. Include manufacturers' brochures and parts lists describing the actual materials used in the work, including metal alloys, finishes, glass, sealants, gaskets, and other major components. Assemble manuals for component

parts into single binders identified for each system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
Provide Floating Floors 3000 by Tate Access Floor Inc.

B. Maxcess

C. Titan

D. Designco Metal Products

2.02 MATERIALS/FABRICATION

A. General: Provide modular standard field panels of size and construction indicated on plans which are interchangeable with other standard field panels. Panels shall be easily placed and removed without disturbing adjacent panels or understructure by one person using a portable lifting device, and free of exposed metal edges in installed position with floor covering in place.

B. Panel Size : 24-inches by 24-inches nickel chrome aluminum floor panels unless otherwise indicated.

C. Fabrication Tolerances

Access panels shall be fabricated with the following tolerances:

1. Dimension of floor panel: +/- 1/8 inch, measured across the length and width of each floor tile.

2. Squareness of floor panel: +/- 1/8 inch, measured across both diagonals of each module.

3. Flatness of floor panel: +/-0.02 inches, measured on a diagonal on top of the panel.

4. Accumulative Gain of floor panel: +1/4 inch, -1/2 inch, measured over installed length of 100 feet.

D. Aluminum Grate Panel

Provide panels constructed of one piece die cast aluminum from manufacturer's standard aluminum alloy. The aluminum must not be less than strength and corrosion resistant

properties of alloy UNS A03830 or UNS A03840 per ASTM B 85, to produce a one piece unit with a flat solid surface on the top and a symmetrically-spaced crisscrossing ribs on the bottom. Panels shall be edge-machined after casting to tolerances indicated. Panel surfaces shall be prepared to receive floor covering.

1. Fabricate panels with pressure insert and adhesively affix plastic edge trim into machined recess in each panel edge; edge trim thickness to match floor finish thickness.

2. Fabricate underside of each panel corner with an integrally cast female socket to receive interlocking male boss which is part of the pedestal head.

E. Aluminum Perforated Panels (chamfered holes)

Provide manufacturer's standard load-bearing perforated metal panels interchangeable with standard field panels and complying with the following requirements:

1. Air Distribution Characteristics Panels Perforated: Where indicated on drawings, provide panels perforated capable of delivering 904 cfm (no damper) at 0.01 inch static pressure.

2. Structural Performance: Perforated panels shall be capable of supporting 1,250 pounds concentrated load.

F. Panel Finish

1. Provide nickel chrome finish electronically applied from factory that is non-particulating, abrasion resistant, corrosion resistant heavy duty laminate.

2. Coating Thickness: 0.002 inch to 0.004 inch thick.

3. Corrosion Resistance: good

G. Floor Panel Covering

Provide rubber conductive tile equal to Noraplan Mega EL as manufactured by Freudenberg. Fabricate in one piece to cover each panel face within perimeter protective edging unless otherwise indicated.

1. Static generation: shall be less than 20 volts per AATCC-134.

2. Resistance to ground: Rtg < 10^6 Ohms

3. Colors and Pattern: Provide floor covering materials complying with standard colors and patterns as selected by owner from manufacturer's standard colors and patterns.

4. Plastic Edging: Manufacturer's standard edge trim applied by manufacturer's standard pressure-inserted method and fastened with adhesive to perimeter of each panel of size and profile.

H. Pedestals/Understructure

Provide manufacturer's heavy-duty pedestal assemblies including base, column with provisions for height adjustment and heavy duty head required to meet the design criteria of this Specification for a 2-foot on center system 2'-0" high.

1. Pedestal Head

Provide heavy-duty die cast aluminum pedestal head of type designed for direct non-bolted support of panels.

2. Grounding Pads

Provide sound-deadening and electrical grounding pads at contact points between pedestal head and panel. Install pad with screen side up.

3. Vibration Locking Device

Provide vibration proof mechanism for making and holding fine adjustments in height for leveling purposes over a range of not less than 2 inches. Include means of locking and leveling mechanism at a selected height, which requires a deliberate action to change height setting and prevents vibratory displacement.

4. Pedestal Base

Provide manufacturer's standard pedestal base fabricated of all aluminum with not less than 25 square inch of bearing area.

5. Pedestal Adhesive

Provide pedestal adhesive compatible with the pedestal base, concrete floor, and floor sealer. Submit for approval the proposed adhesive anchoring system, including curing characteristics for the anticipated environmental conditions, MSDS and ventilation requirement. Adhesives shall be VOC compliant and non-outgassing.

6. Perimeter Pedestals

   Provide custom pedestals at the perimeter of the cleanroom floor area to support the floor system up tight to the cleanroom walls.

7. Angle Brace (ledger angle)

   Provide angle braces at each pedestal which occurs at the perimeter of the cleanroom, along exposed edges of access floor (i.e., where access floor has been interrupted for placement of equipment, walls, expansion joints, columns, or vertical shafts and where required for stability of system).

8. Perimeter Support

   Provide, where indicated on drawings, manufacturer's standard engineered aluminum extrusions and attachment methods to support panel edge. Extrusion shall be same level as access flooring.

2.03 ACCESSORIES

A. Colors and Finishes

Natural color and finish as provided by die-cast steel process.

B. Panel Cutouts

Comply with requirements indicated for size, shape, number, and location. Include reinforcement or additional support if needed to make panels with cutouts comply with standard performance requirements. The cutout system shall be made available for purchase by the owner for installation during cleanroom fit-up and operations.

1. Provide cutouts with manufacturer's standard plastic molding.

2. Provide cutouts with manufacturer's standard grommets in sizes indicated or, where size of cutouts exceed maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding having tapered top flange.

3. Removable covers for grommets.

4. Non-outgassing plastic pads for sealing annular space formed in cutouts by cables and trim edge of cutout with molding having flange and ledge for capturing and supporting pads. Submit the material for approval before start of work.

C. Cable Cutout Protection

Shall be of extruded polyvinyl chloride or neoprene edging, self-extinguishing.

D. Panel-Lifting Devices

1. Provide 20 devices, manufacturer's standard type recommended for panel type with floor covering provided.

E. Gaskets

1. Provide non-outgassing, closed cell polymer material, preformed to the profile indicated.

2. Submit sample and data sheet for approval.

3. All materials, including adhesive gaskets, paint, and other plastic components, shall be submitted for approval, including a sample of each material.

F. Plenum Dividers

1. Provide manufacturer's standard ga. Aluminum, under-floor plenum divider where located in plan and section drawings which will divide the plenum under-floor system to provide an airtight segregation.

PART 3 - EXECUTION

3.01 PREPARATION

A. Manufacturer's Startup Services

1. The manufacturer's service representative shall provide representation during receipt and unloading of the materials in the presence of the Owner and the Construction Manager.

2. Upon completion of the inspections, the manufacturer shall submit written notice to the Owner that the units were received and stored/handled satisfactorily and are ready for installation.

3. The manufacturer shall inspect the final installed product and issue a letter certifying that the installation was performed in a manner that will enforce all of the warranty

requirements.

B. Field Measurements

1. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work; otherwise, indicate final measurements

C. Pre-installation Subfloor Field Test – Prior to proceeding with installation of pedestals, field test their attachment to fab level surface as follows:

1. In areas representative of each subfloor surface condition, secure typical pedestal assemblies using non-outgassing adhesive.

2. Allow test installation to cure for 14 days with a pressure of 25 pounds applied vertically to pedestals during this period.

3. After curing, apply lateral loads against a straight steel extension bar inserted 2 inches into pedestal stems. Measure with spring scale the force needed to cause failure between pedestal base and subfloor.

4. Do not proceed with installation until tests evidence compliance with indicated requirement for pedestal's capability to resist overturning moment.

5. Locate each pedestal and completely remove any dust, dirt, and construction debris before starting installation.

3.02 INSTALLATION

A. Conform to the requirements of Section 01110S – CLEANROOM CONSTRUCTION PROTOCOL concerning cleanroom protocol and schedule.

B. Install floor system and accessories under the supervision of the manufacturer's authorized representative to ensure rigid, firm installation, free of vibration, rocking, rattles, squeaks, and other unacceptable performance.

C. Set pedestals as recommended by the floor manufacturer to provide full bearing of the pedestal base on the concrete floor. Provide adhesive that is compatible with the concrete floor coating as specified in Section 09670S. Set pedestal bases true to cleanroom grid line. All voids and pockets of pedestal base shall be filled with adhesive.

D. Accurately scribe and fit plenum dividers to concrete floor and raised floor panel and seal

with non-off gassing, VOC compliant elastomeric sealant to ensure a air tight plenum.

E. Thoroughly vacuum the concrete floor area as installation of floor system proceeds. Extend cleaning under installed panels as far as possible.

F. No-dirt-or debris-producing operations will be permitted in the rooms where the floor is being installed.

G. Perform all dirt-or debris-producing operations as remotely as possible from installation area in manner to prevent contamination of concrete surfaces under sections of access floor which already have been installed.

H. Level installed access floor to within 0.01 inch of true level over the entire area and within 0.0625 inch in any 10-foot distance. Floor shall be set level with scheduled finish floor material installed on the structure.

3.03 FIELD QUALITY CONTROL

A. Contractor's Testing Laboratory

1. The Contractor shall employ a qualified, independent, laboratory to perform the following:

   a. Pre-installation Adhesive Concrete Field Test: Prior to proceeding with installation of pedestals, field test adhesion to coated concrete surfaces as follows:

   b. In areas representative of each concrete surface conditions with surface coatings, set typical pedestal assemblies in same adhesive and methods required for completed work.

3.04 ADJUSTING

A. Upon completion of work, repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace work, which is damaged or cannot be adequately cleaned as directed.

3.05 CLEANING

A. After completion of installation, vacuum clean the entire floor system.

B. Replace access floor panels which are chipped, broken, stained, scratched, or otherwise damaged or do not conform to specified requirements.

3.06 PROTECTION

A. Protect the work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

3.07 SCHEDULES

A. Provide a guideline document for tool move-in procedures. Guideline document shall address the following tool move-in categories

1. Maximum point load requiring no special floor reinforcing procedures.

2. Point load range requiring load-spreading system(s) (surface load distribution platea and/or underfloor reinforcing).

3. Maximum load(s) utilizing air-bearing move-in procedures. The Contractor shall coordinate guidelines with Owner's air bearing sizes.

B. The guidelines above shall address the following:

1. Minimum wheel diameter and width.

2. Maximum move-in speed.

3. Load distribution plate material thickness, size, and layout.

4. Specific underfloor panel reinforcing requirements.

END OF SECTION